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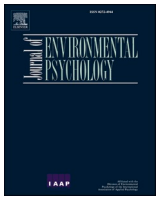

Everything is connected: Reminders of environmental and social connectedness strengthen environmental attitudes

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ABSTRACT

In two studies, we examined the effects of receiving reminders of environmental and social connectedness on environmental attitudes. We developed a novel experimental paradigm to induce feelings of connectedness with vignettes. Environmental attitudes were assessed with the Environmental Concern and Awareness of Consequences scales, both of which included three subscales (biospheric, social, and egoistic). In Study 1 (N = 774), we found that receiving a reminder of environmental connectedness increased environmental concern (biospheric) and awareness of consequences (biospheric and social) for individuals who did not feel connected to nature or other people. In Study 2 (N = 854), we replicated and extended these results, showing that receiving a reminder of environmental or social connectedness also increased environmental concern (biospheric and egoistic) for individuals who did not feel connected to nature or others. The findings show that reminders of environmental and social connectedness can promote people's awareness of, and concern for, the environment, especially among individuals with low dispositional connectedness.

1. Introduction

Feeling connected with nature is one of the most significant factors of having empathy and compassion towards nature (Dutcher et al., 2007; Schultz, 2000), and it contributes positively to environmental attitudes and behaviours (Nisbet et al., 2009; Stern, 2000). Previous research suggests that a sense of connectedness to nature is a significant construct associated with environmentalism (Dutcher et al., 2007; Kals et al., 1999; Nisbet et al., 2009; Roszak, 1995). In addition, connectedness to nature predicts environmental behaviour and subjective well-being (Martin et al., 2020; Mayer & Frantz, 2004), while behaving environmentally becomes more likely when one's identity expands to encompass the natural world (Clayton, 2003).

Being aware of the connections between people and nature is the core of environmental ethics. The human responsibility for protecting the environment stems from the perceived symbiotic connection with nature (Schultz, 2002). Early environmentalists' basic premise was that humans are interdependent, and belong in the same community, with all living organisms. In accordance with this, Aldo Leopold (1949) introduced a *land ethic*, which stated that in order to address the environmental problems, the boundaries of the community to which humans belong should extend to collectively embrace the land (i.e. animals, plants, waters etc.). Therefore, lack of connectedness with nature could be one of the main reasons for the ecological crisis (Dutcher et al., 2007; Frantz et al., 2005; Ives et al., 2018; Soga & Gaston, 2016).

Dutcher and colleagues (2007) argued that connectedness is a perception of sameness between the self, others, and the natural world, and that environmental concern and behaviour are expressions of a sense of connectedness with nature. In other words, individuals who perceive a fundamental similarity between themselves and the natural world will be more compassionate towards nature. Bamberg and Möser (2007) also propose that environmental behaviour is a combination of self-interest and concern for other people, other species, or whole ecosystems. Similarly, sustainable behaviour encompasses caring for the self, others, and the biosphere (Corral-Verdugo et al., 2021).

Although connectedness to nature is considered a rather stable disposition (Brügger et al., 2011; Kellert & Wilson, 1993; Tam, 2013; Zylstra et al., 2014), people can become more connected with their

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natural environment, just as they can become more connected with other people (Schultz, 2000). Previous research has shown that connection to nature can be increased temporarily with exposure to nature (Mayer et al., 2009) and with increased contact with nature (Beery, 2013; Barton et al., 2016; Lumber et al., 2017). Taking the perspective of an animal has also been shown to lead to greater inclusiveness, and thus greater levels of biospheric concern (Schultz, 2000). This perspective-taking may temporarily increase the extent to which individuals view themselves as interconnected with nature. Davis and colleagues (2009) also found that individuals who were primed to experience high commitment to the environment reported greater levels of environmental behavioural intentions, as well as environmental behaviour, in comparison with participants induced to experience low commitment to the environment.

1.1. Social connectedness

Besides being connected to nature, environmental behaviour may arise when a person feels connected to other people, as it is a type of prosocial behaviour. Collective action and identification with humanity may foster the form of prosociality that environmental behaviour constitutes (Klein et al., 2022). Altruistic concerns regarding the welfare of others are important for individuals to behave environmentally (Heberlein, 1972), highlighting the prosocial nature of environmental behaviour (Otto et al., 2021). Environmental behaviours are motivated by a specific form of altruism, which is caring for the larger community (Allen & Ferrand, 1999), and those who adopt them have stronger altruistic or self-transcendent values (Stern & Dietz, 1994). Caring for others has also been linked to sustainable behaviour (e.g. supporting charities; Corral-Verdugo et al., 2021). Moreover, feelings of belonging to humanity as a whole have been linked to reduced psychological distance of climate change (Loy & Spence, 2020) and environmental behaviours (Der-Karabetian et al., 2014). Other findings have also shown that connectedness to community, humanity and nature mediate the relationship between one's prosocial propensity (such as altruism) and pro-environmental behaviours (Duong & Pensini, 2023).

In a recent review (Pong & Tam, 2023), the authors found that most studies showed a stable positive link between global identity and environmental behaviour and environmental concern. Individuals with a strong global identity, that is feeling connected to humanity, are more likely to care about the welfare of others and be concerned about environmental problems (Chan et al., 2020), to feel a sense of responsibility for their actions on other people and on nature (Barth et al., 2015; Ng & Basu, 2019) and have a sense of community (Scafuto, 2021; Woosnam et al., 2019).In addition, identification with humanity is associated with moral norm which in turns predicts behavioural intentions. According to social identity theory, individuals who identify as members of a social group are more likely to care about the welfare of other members and act in the interest of the group (Tajfel & Turner, 1979). Moreover, based on the interconnectedness theoretical perspective, the world is a single community sharing a common fate; thus, members of the community have a responsibility to other members and the community itself (Pong & Tam, 2023). Thus, there is a positive association between connectedness to nature and connectedness to community (Sanguinetti, 2014) as well as connectedness to humanity (Lee et al., 2015; Moreton et al., 2019). This latter association has been partly explained by shared prosocial personality traits, suggesting that people who feel connected to nature were more likely to also feel connected to all humans (Lee et al., 2015). Furthermore, those who have a stronger awareness of their own connection to the natural world and others are less egocentric, more concerned about other people, and more oriented toward social relationships and ecological issues (Leary et al., 2008). In accordance with this, more recent evidence has shown that feelings of connectedness to nature, and to other people, are associated with environmental attitudes and eco-conscious consumer behaviour (Drosinou et al., 2023).

In this paper, we examine whether reminding people of the interconnectedness of the world (both nature and other people) enhances feelings of environmental and social connectedness and has a positive impact on environmental attitudes.

1.2. Value-Belief-Norm model

According to the tripartite Value-Belief-Norm (VBN) model, there are three value orientations that provide a distinct basis for environmentalism: egoistic, social-altruistic, and biospheric (Stern, 2000; Stern et al., 1999). The model proposes that personal environmental norms emerge in response to possible adverse consequences for the valued object. Egoistic values lead to concern for environmental issues on the basis of costs for the self, social-altruistic values lead to environmental concern on the basis of costs for other people, and biospheric values lead to concern on the basis of costs for all living things. These value orientations are distinguishable though intercorrelated (Stern et al., 1993).

Two important constructs arise from the VBN model in the context of environmental social psychology: Environmental Concern and Awareness of Consequences. Environmental concern refers to the affect associated with environmental problems and is an aspect of an environmental attitude (Schultz et al., 2005). Stern and Dietz (1994) argued that environmental concern is based on the value people place on themselves, other people, and animals or plants. Schultz (2000) further proposed three sets of valued objects that are directly linked with environmental concerns: self, other people, or other living things. These concerns are not independent from another, they rather "reflect varying levels of the inclusiveness of an individual's notion of self" (Schultz, 2000, p. 393). That is, the degree to which a person views themselves as independent, interdependent with other people, or interdependent with all living things is related to the type of environmental concern they feel.

In accordance with the VBN model, Awareness of Consequences reflects the degree to which people are aware of the adverse environmental consequences for valued objects: oneself, other people and nature. Similar to Environmental Concern, Awareness of Consequences consists of three clusters that differentiate between these orientations: egoistic, social and biospheric. Thus, a person with a social value orientation (i.e. other people are considered as the value object) would focus on situations that are threatening to people, as a value orientation leads individuals to direct their attention on value-congruent information and discard value-incongruent information (Stern, 2000; Stern et al., 1999). In line with this, other research (Schultz et al., 2005; Stern et al., 1995) proposes that values influence the extent to which people are aware of the negative consequences of environmentally harmful behaviour (i.e., problem awareness).

Given the association between a sense of connection and environmentalism, it is crucial to examine whether this association can be strengthened. Based on previous findings, nature-based interventions can be very effective in promoting environmental and social connectedness by activating intrapersonal, interpersonal, and environmental processes (see Leavell et al., 2019 for a review). In this study, we examine if enhancing people's sense of connectedness with nature and other people leads to positive changes in their environmental attitudes (i.e., environmental concern and awareness of consequences). As our measures of environmental attitudes are tripartite, in accordance with the VBN model, the connectedness could manifest through all three levels or just one of them.

1.3. Current studies

We designed two studies to examine how dispositional and situational connectedness predict environmental concern and awareness of consequences. We used a novel experimental paradigm which elicits feelings of connectedness (with nature and others) with vignettes, while also measuring dispositional connectedness. We expected that people with higher dispositional connectedness would report stronger

environmental attitudes. We further expected that people who receive reminders of interconnectedness would also report stronger environmental attitudes. Finally, we expected that individuals with low (as compared with high) dispositional connectedness would be more strongly affected by our connectedness task due to higher susceptibility to further positive change. The rationale is that reminding people of the interconnectedness of the world can increase their sense of belonging and emotional attachment (especially for those who feel less connected), leading to a more positive shift in their environmental attitudes.

We further examined whether people who receive reminders of connectedness would also feel more connected to other people, as previous literature shows a link between environmental and social connectedness. It is possible that people who feel connected to nature also feel connected to others and vice versa. Feeling connected to nature is initially born through our connection with other people, as we first make connections with the world and explore it through our parents, siblings, and peers. Thus people could extend this connectedness to nature through other people.

Our assumptions are also in line with the Integrated Framework for Encouraging Pro-Environmental Behaviour (IFEP; Steg et al., 2014), according to which environmental behaviour is most effectively influenced by individual normative goals. Normative goals involve acting in an appropriate manner (i.e. what is the right thing to do) by benefiting other people or the environment, and sensitivity towards what individuals ought to do to contribute to environmental protection. IFEP suggests that strengthening individual normative goals can positively influence environmental behaviour. Based on this theoretical framework, the strength of normative goals depends on both individual dispositions (i.e. values) and situational cues. Thus, normative goals become chronically stronger when individuals endorse certain values which are more impactful when activated by situational cues. More specifically, biospheric and altruistic values seem to influence the chronic accessibility of normative goals. In our paper, we examine the role of individual dispositions/value orientations (i.e. connectedness to nature and other people) together with situational cues (i.e. environmental and social connectedness reminders) in strengthening environmental attitudes. We are interested in biospheric and altruistic values as reflected in environmental concern and awareness of consequences.

2. Pilot study 1

In the first pilot study, we tested the materials that we developed in order to later examine whether reminders of environmental connectedness lead to more environmental attitudes. We tested whether people who receive reminders of everything in nature being interconnected, and that they themselves belong to this larger whole, would feel more connected to nature. In addition, we examined whether people who receive such reminders would also feel more connected to others.

2.1. Method

2.1.1. Participants and procedure

Seventy-nine participants[1] (N = 79, 53 female; Age_M = 33.73, SD = 12.51, Range = 18–65) were recruited through Prolific (www.prolific.com). Out of the participants, 78 were UK and 1 were Irish nationals.

Participants first gave their informed consent to participate in a pilot study regarding a "visualisation exercise". After completing the online questionnaire, participants were debriefed, and compensated.

2.1.2. Design

Participants were randomised into one of two conditions: environmental connectedness (N = 39), and neutral (N = 40). First, participants read the vignette and then answered the manipulation checks/dependent measures.

2.1.3. Materials

2.1.3.1. Vignettes. In the environmental connectedness condition, participants were provided with a short text reminding them that all life and everything in nature is interconnected, and that people are part of this larger whole. In the neutral condition, participants read a text about how a building consists of interconnected materials. Participants were asked to engage with the images as much as they could. For the exact text of the vignettes see Appendix A.

2.1.3.2. Manipulation checks/dependent variables

2.1.3.2.1. Inclusion of Nature in Self (INS). Using seven pictures of overlapping circles representing *Self* and *Nature,* participants were asked to choose the picture that best showed how interconnected they feel to nature in general (Schultz, 2001, 2002). Scores ranged from 1 (where the circles touched but did not overlap) to 7 (where the circles were almost completely overlapping); higher scores show higher levels of interconnectedness with nature.

2.1.3.2.2. Close to nature. We measured how close to nature participants felt after reading the vignette with 5 items (e.g. "After the visualisation exercise how much do you feel … a part of nature/closer to nature"; α = .95) anchoring from 1 (not at all) to 7 (very much). Higher scores indicate feeling closer to nature.

2.1.3.2.3. Feelings. We measured how participants felt after reading the vignette with 9 items of positive (e.g. "satisfied"; α = .88), negative (e.g. "stressed"; α = .86) and neutral affect (with a single item, i.e. "neutral") anchoring from 1 (not at all) to 7 (very much). Higher scores indicate more positive, neutral, and negative feelings respectively.

2.1.3.2.4. Overall experience. We measured the overall experience of the participants regarding the "visualisation exercise" with 5 items (e.g. "How much were you engaged in the experience?" and "How well were you able to focus?"; α = .90) anchoring from 1 (not at all) to 7 (very much). Higher scores indicate a better overall experience of the visualisation exercise.

2.1.3.2.5. Inclusion of other in self (IOS). Similarly to INS, participants were asked to choose the picture that best showed how interconnected they feel to other people in general (Aron et al., 1992) by using seven pictures of overlapping circles representing *Self* and *Other*. Scores ranged from 1 (where the circles touched but did not overlap) to 7 (where the circles almost completely overlapped); higher scores show higher levels of interconnectedness with others.

For the psychometric properties of the scales see Table B.1 and for the means, SDs, and Cohen's d per condition see Table B.2. (Appendix B).

2.2. Results

We first examined the effect of the vignettes on Inclusion of Nature in Self (INS): ANOVA analysis showed that the mean of the environmental condition (M = 4.89, SD = 1.29) was significantly higher than the neutral condition (M = 3.22, SD = 1.27; $F(1, 77) = 33.60$, $p < .001$). See Fig. 1.

We also examined the effect of the vignettes on Close to Nature. The results showed that, similarly to INS, the environmental condition (M = 4.95, SD = 1.17) was significantly higher than the neutral condition (M = 2.78, SD = 1.32; $F(1, 77) = 60.04$, $p < .001$). See Fig. 1.

Participants also reported more positive feelings in the environmental condition (M = 5.17, SD = .94) as compared to the neutral condition (M = 4.00, SD = 1.06; $F(1, 77) = 26.74$, $p < .001$); see Fig. 1. There were no differences between conditions for negative feelings, as those were in general on low levels for all conditions (Ms < 2.05, SDs

[1] For the pilot studies, we did not conduct a power analysis; since we were only interested in main effects, we followed the APA recommendation for at least 30 participants per cell (Kelley & Maxwell, 2012).

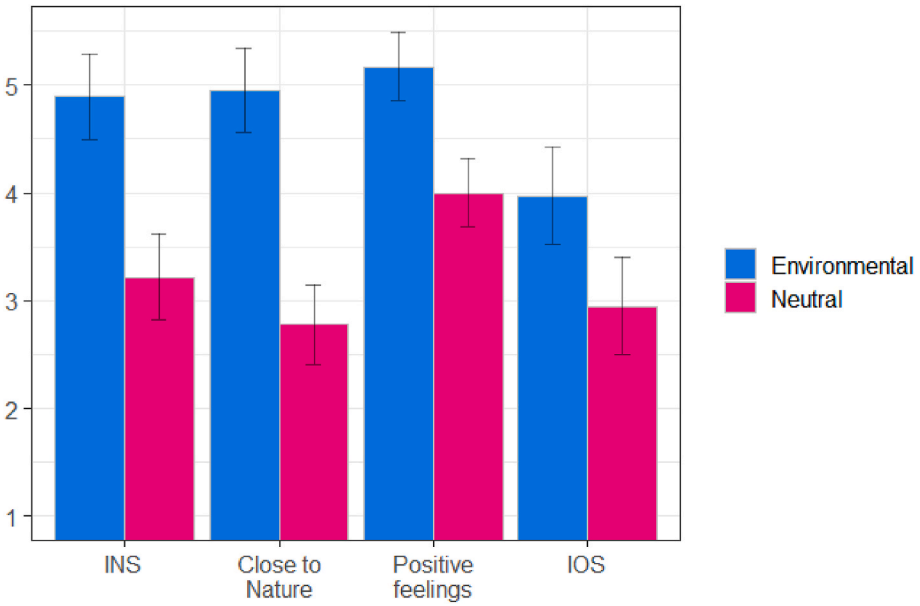

Fig. 1. Mean scores for Inclusion of Nature in Self (INS), Close to Nature, Positive feelings, and Inclusion of Other in Self (IOS), in Environmental and Neutral Conditions. Error bars are 95% CI.

<1.30; F (1, 77) = .06, p = n.s).

Furthermore, we investigated the effect of the vignettes on the overall experience of the participants. The results showed that there were no significant differences among conditions (F (1, 77) = 1.41, p = n.s), indicating that the vignettes were equal to each other in terms of maintaining the focus and the engagement of the participants (Ms > 5.06, SDs <1.22).

Finally, we examined the effect of the vignettes on Inclusion of Other in Self (IOS). Indeed, the results showed increased social connectedness in the environmental condition (M = 3.97, SD = 1.63) as compared to the neutral condition (M = 2.95, SD = 1.33; F (1, 77) = 9.33, p = .003). See Fig. 1. These results show that when induced with environmental connectedness, people felt more socially connected as well, in other words they reported feeling closer to other people as a result.

2.3. Discussion

The results of the first pilot study show that the vignettes work as intended. For all the DVs, the participants' scores were significantly higher in the environmental condition than in the neutral condition. Most importantly, the environmental condition vignette led participants to feel closer and more interconnected to nature. Furthermore, it led participants to feel more interconnected to other people. This finding is in accordance with previous research showing an association between feeling connected to nature and feeling connected to others (Lee et al., 2015; Moreton et al., 2019). As such, we employed these vignettes in the subsequent study to enhance feelings of environmental connectedness.

3. Study 1

In this first study, we examined the effect of receiving a reminder of environmental connectedness on two environmental measures (Environmental Concern and Awareness of Consequences). We expected to observe stronger reported environmental attitudes as a result of the reminder compared to the control condition. We further expected that the levels of dispositional connectedness (IOS and INS) would interact with the experimental conditions so that people low in connectedness would report stronger environmental attitudes after being reminded of environmental interconnectedness. This is because there is more room for change for individuals low in connectedness; their baseline attitudes are likely less influenced by the recognition of interconnectedness between humans and nature, leaving them more open to adopting new perspectives. In contrast, individuals with high dispositional connectedness, already inclined to feel a sense of unity with others and nature, may show less of a shift in their environmental attitudes. Their baseline attitudes are likely to reflect environmental views, meaning that reminders of environmental interconnectedness may serve to reinforce rather than significantly change their pre-existing beliefs.

3.1. Method

3.1.1. Participants and procedure

We collected a convenience sample. Seven hundred and seventy-four participants[2] (N = 774, 395 female; Age_M = 41.54, SD = 13.78, Range = 18–85) were recruited through Prolific and successfully completed the study.[3] Out of the participants, 757 were UK and 17 were Irish nationals, and 344 (44.4%) had a University Bachelor's degree.

Participants first gave their informed consent to participate in a study regarding a "visualisation exercise". After completing the online questionnaire, participants were debriefed, and compensated.

[2] ANCOVA power simulations (R library Superpower the Cohen method, https://cran.r-project.org/web/packages/Superpower/vignettes/ANCOVAs.html), based on hypothesised effect sizes B = .225 and R^2 = .01, showed that we would need about 800 participants to have about 80% power to find main effects for the experimental manipulation together with a covariate and their interaction. – The effect-size was estimated based on previous experience of running similar studies by erring on the conservative size. The effect-size of 1% of explained variance is within the typical range of psychological study effects that range from small (1% of variance explained) to medium large (about 9% of explained variance).

[3] We excluded participants based on total time of completion (i.e. beyond 2SD from the mean; 40 pps; 20 in the environmental and 20 in the neutral condition), failing the attention check (i.e. "Please choose 'not important'."; 5 pps; 3 in the environmental and 2 in the neutral condition) and the manipulation checks. Specifically, we excluded participants who reported they were not engaged in the experience, and participants who clearly did not react to the visualisation exercise (reported an average score of less than 3 on the Close to Nature scale in the environmental condition; 46 pps) and those who unrealistically reported a very high connection to nature after visualising a building (an average score of higher than 6 in the neutral condition; 17 pps).

3.1.2. Design

Participants were randomised into one of two conditions: environmental connectedness (N = 371), and neutral (N = 403). First, participants completed the individual differences (i.e., dispositional) measures and then they read the vignette. Next, they answered the manipulation checks and the dependent variables.

3.1.3. Materials

3.1.3.1. IOS. See Pilot Study 1 for more details.

3.1.3.2. INS. See Pilot Study 1 for more details.

3.1.3.3. Vignettes. We used the same vignettes as in Pilot Study 1.

3.1.3.4. Manipulation checks

3.1.3.4.1. Close to nature. See Pilot Study 1 for more details (α = .96).

3.1.3.4.2. Overall experience. We measured the overall experience of the participants regarding the "visualisation exercise" with a single item (i.e. "How much were you engaged in the experience?") anchoring from 1 (not at all) to 7 (very much). Higher scores indicate a higher engagement.

3.1.3.5. Dependent variables

3.1.3.5.1. Environmental concern. Concern for environmental problems was measured with 12 items (Schultz, 2001). Participants were asked to rate the items in response to the question: I am concerned about environmental problems because of the consequences for: "Plants and trees", "Marine life", "Birds and Animals" (Biospheric concern, α = .91); "Humanity", "People in my Community", "Future generations" (Social concern, α = .85); "My future", "My health", "My lifestyle" (Egoistic concern, α = .86). All items were anchored from 1 = Not at all important to 7 = Very important. A score was computed for each subscale separately, as well as for all the 12 items (α = .88). Higher scores reflect higher biospheric, social and egoistic concern respectively.

3.1.3.5.2. Awareness of consequences. The AC scale (Ryan & Spash, 2012) measures the degree to which people are aware of the environmental consequences regarding themselves, other people, and nature. It consists of 15 items that are further categorised into three 5-item subscales: Egoistic (e.g. "Environmental protection is beneficial to my health.", "Environmental protection will provide a better world for me and my children."; two items were reversed coded; α = .72), Social (e.g. "Environmental protection benefits everyone.", "Pollution generated here, harms people all over the Earth."; one item was reversed coded; α = .81), and Biospheric (e.g. "Over the next several decades, thousands of species will become extinct.", "Modern development threatens wildlife."; two items were reversed coded; α = .76). Items were measured on a 7-point scale from Strongly disagree to Strongly agree. A score was computed for each subscale separately, as well as for all the 15 items (α = .90). Higher scores reflect higher awareness of egoistic, social and biospheric consequences respectively.

For the psychometric properties of the scales see Table C.1 and for the means, SDs and Cohen's d per condition see Table C.2. (Appendix C).

3.2. Results

We first run an one-way ANOVA on the DVs (Environmental Concern Bio, Social, and Ego & Awareness of Consequences Bio, Social, and Ego)[4] with Condition as a fixed factor predictor. There was a statistically significant effect for Environmental Concern Bio (F (1, 772) = 7.75, p = .005, η^2 = .009), Awareness of Consequences Bio (F (1, 772) = 6.49, p = .011, η^2 = .008), and Awareness of Consequences Social (F (1, 772) = 4.51, p = .034, η^2 = .005). No other statistically significant effects were observed.

After this, we examined the interaction between the standardised INS and Condition on the three DVs that were significant in the previous analysis. We only found a main effect of INS for all the three DVs (all Fs > 61.71 and all ps < .0001).

We then repeated the above analysis for the standardised IOS (see Table 1 for full statistics).

For Environmental Concern Bio, all predictors and their interaction term were statistically significant (all Fs > 7.28 and all ps < .007). We further inspected the simple slope effects at -1SD and +1SD between the experimental conditions. When IOS was low (-1SD), there was a statistically significant difference between the Environmental and Neutral conditions (B = −.44, 95% CI [−.64,-.23]; F (1, 770) = 17.59; p < .00001), but this difference was not observed at +1SD (F (1, 770) = .15, p = n.s.). See Fig. 2. This implies that when people do not feel connected to others, receiving a reminder of environmental connectedness increases their level of biospheric concern.

For Awareness of Consequences Bio, we found a similar trend (marginally significant) where there was a strong effect of IOS at -1SD (B = −.28, 95% CI [−.46, −.09]; F (1, 770) = 9.18; p = .002), but no effect at +1SD (F (1, 770) = .20, p = n.s). For Awareness of Consequences Social, there was a similar pattern of IOS at -1SD (B = −.27, 95% CI [−.45, −.09]; F (1, 770) = 8.84, p = .003) and at +1SD (F (1, 770) = .03, p = n.s.).

Next, we investigated the effects of both standardised IOS and INS and their interaction with the Condition on Environmental Concern Bio, Awareness of Consequences Bio and Social. For Environmental Concern Bio, we still observed the significant interaction between IOS and Condition (F (1, 766) = 5.46, p = .019), and the strong main effect of INS (F (1, 766) = 180.45, p < .0001). For Awareness of Consequences Bio, we only observed the main effect of INS (F (1, 766) = 51.65, p < .0001), and for Awareness of Consequences Social the main effects of IOS (F (1, 766) = 12.38, p < .001) and INS (F (1, 766) = 60.34, p < .0001).

We then proceeded by visually inspecting the plot for the four dimensional model for Environmental Concern Bio (Fig. 3), and performing a simple slopes (contrast) analysis. The results indicated that the experimental manipulation only affected those who were at mean or below in INS, and low in IOS (INS at mean & IOS at -1SD: F (1, 766) = 6.42, p = .011, B = −.24, 95% CI [−.43, −.05]; INS & IOS at -1SD: F (1, 766) = 10.87, p = .001, B = −.39, 95% CI [−.63, −.15]). These findings suggest that when people do not feel connected to nature or other

Table 1
Inferential statistics for ANOVAs for each DV.

	Environmental Concern Bio		
	F	p	η^2
Condition	7.28	**.007**	.009
IOS	18.05	**.000**	.022
Condition*IOS	10.52	**.001**	.013
R^2	.048		
	Awareness of Consequences Bio		
	F	p	η^2
Condition	6.06	**.014**	.007
IOS	10.63	**.001**	.013
Condition*IOS	3.35	.067	.004
R^2	.027		
	Awareness of Consequences Social		
	F	p	η^2
Condition	3.99	**.046**	.005
IOS	27.96	**.000**	.035
Condition*IOS	4.91	**.027**	.006
R^2	.048		

Note. Statistically significant effects have been bolded.

[4] For the Factor analyses of the Environmental Concern and Awareness of Consequences scales, see Appendix D.

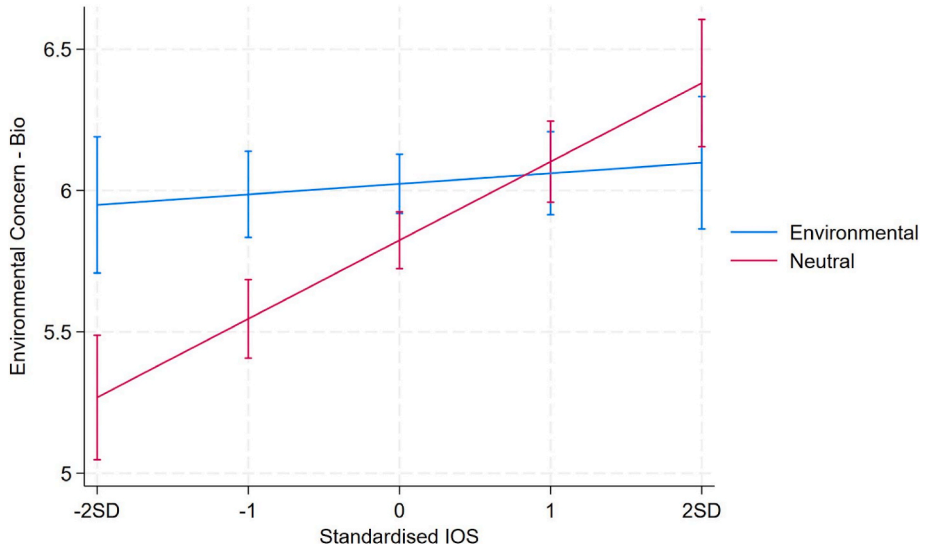

Fig. 2. ANCOVA analysis shows a significant interaction effect between Condition (i.e. receiving a reminder of connectedness with nature) and IOS (i.e. feeling interconnected with others) on Environmental Concern - Biospheric. In addition, there is a main effect of IOS.

people, receiving a reminder of nature connectedness increases their biospheric concern. However, when people feel dispositionally connected to nature, they report higher levels of biospheric concern irrespective of the reminder.[5]

3.3. Discussion

We examined the effect of feeling connected to nature or other people and receiving a reminder of environmental connectedness on environmental concern and awareness of consequences regarding environmental degradation. After receiving a reminder of environmental connectedness, people who did not feel dispositionally connected with others were more likely to become more concerned for the environment and more aware of the consequences for nature and others. We also found that for people who did not feel connected with nature or others, receiving a reminder increased their biospheric concern.

In general, people were more likely to feel concern for nature and to become aware of the biospheric and social consequences of environmental degradation when they received a reminder of environmental connectedness. This finding highlights the potential of inducing environmental connectedness in strengthening environmental attitudes. However, people who felt already connected with nature were more concerned for nature and more aware of the consequences for the environment and for other people, as compared to those who did not feel connected, in accordance with previous research (Dutcher et al., 2007; Schultz, 2000). Finally, people who felt already connected with other people were also more concerned for nature and more aware of the consequences for the environment and for other people, indicating the importance of other connectedness for increased environmental attitudes; these individuals were unaffected by the reminder.

These results show that reminders of environmental connectedness can increase environmental concern (biospheric) and awareness of consequences (biospheric and social). Nonetheless, people who feel connected with nature or other people report high environmental attitudes in general. Therefore, receiving a reminder of environmental connectedness is especially important for those who do not feel connected (as they are more influenced by the reminder), because it can result in higher environmental attitudes.

These findings are in line with research on nature connectedness showing that people who feel connected with nature are more likely to have environmental attitudes (Schultz, 2001; Stern, 2000). When people feel that they are not separate from nature, they are more inclined to protect the environment to feel a moral obligation to do so (Schultz, 2002). As the connection with the natural world becomes more salient and personal, pro-environmental attitudes increase due to heightened sense of responsibility, awareness of environmental issues, and a deeper appreciation for the intrinsic value of nature (Perkins, 2010; Schwartz, 1977). Furthermore, as feeling connected with nature is associated with feeling connected with people (Lee et al., 2015; Moreton et al., 2019), environmental attitudes can also increase as an expression of altruism (Heberlein, 1972) and concern for others (Stern & Dietz, 1994; Stern et al., 1999). Because the environment is a public good, an altruistic orientation is necessary for individuals to be environmentally engaged (Heberlein, 1972). Based on the Schwartz's (1977) moral norm-activation theory, altruistic and pro-environmental behaviour happens when personal moral norms are activated in response to threatening situations that can be averted through certain actions (thus entail responsibility), and an understanding that people's actions can have consequences for the welfare of others (awareness of consequences).

Given the prominence of connectedness with others in this first study, we decided to proceed by running another experiment where we would give participants reminders of social connectedness as well as environmental connectedness in order to examine their effects on environmental concern. Our assumption was that people would report more concern after receiving a reminder of social connectedness.

4. Pilot study 2

In the second pilot study, we further tested the materials that we developed in order to later examine whether environmental and social connectedness predict more environmental attitudes.

More specifically, we tested whether people who receive reminders of either environmental or social connectedness would feel more connected to either nature or to other people. We also examined whether inducing environmental connectedness would increase ratings of inclusion of other in self and whether inducing social connectedness would increase ratings of INS.

[5] For the results of the analyses without exclusions see Appendix E.

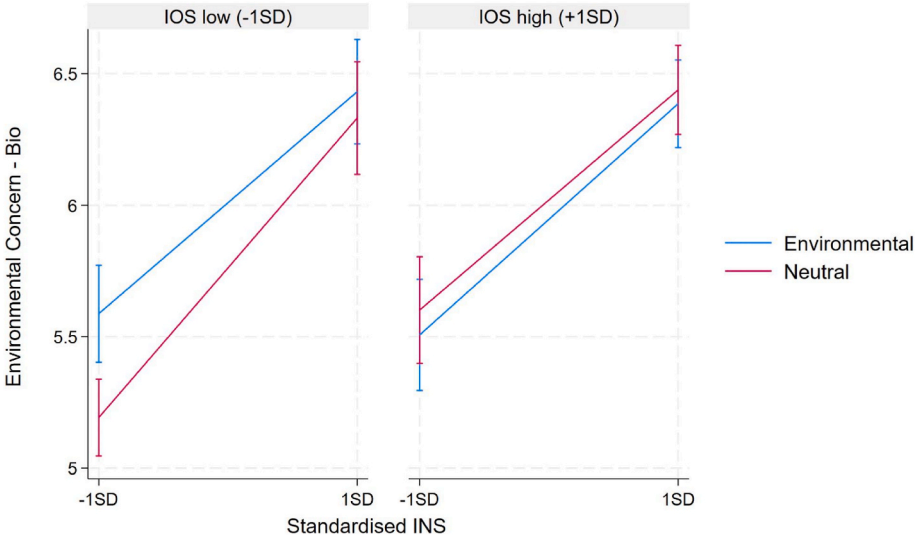

Fig. 3. ANCOVA analysis shows a significant interaction effect between Condition (i.e. receiving a reminder of connectedness with nature), and IOS (i.e. feeling connected with others) on Environmental Concern - Biospheric. In addition, there is a significant main effect of INS.

4.1. Method

4.1.1. Participants and procedure

In total, 117 (N = 117; 73 female) participants (Age_M = 35.75; SD; = 13.77; Range = 18–74) were recruited through Prolific. Out of the participants, 114 were UK and 3 were Irish nationals.

Participants first gave their informed consent to participate in a pilot study regarding a "visualisation exercise". After completing the online questionnaire, participants were debriefed, and compensated for their time.

4.1.2. Design

Participants were randomised into one of three conditions: environmental connectedness (N = 41), social connectedness (N = 39), and neutral (N = 37). First, participants read the vignette and then they answered the manipulation checks/dependent measures.

4.1.3. Materials

4.1.3.1. Vignettes. In the environmental condition, participants were provided with a short text that reminded them that everything in nature is interconnected. In the social condition, participants read a short text that reminded them that all people are interconnected. In the neutral condition, participants read about how a building consists of interconnected materials. Participants were asked to try to engage with the images as much as they could. For the exact text of the social connectedness vignette see Appendix F.

4.1.3.2. Manipulation checks/dependent variables. The order in which the variables were presented was counterbalanced across conditions.

4.1.3.2.1. Inclusion of other in self (IOS). See Pilot Study 1 for more details.

4.1.3.2.2. Close to others. We measured how much participants felt close to other people after reading the vignette with 5 items (e.g. "After the visualisation exercise how much do you feel … a part of a wider community/closer to others"; α = .93) anchoring from 1 (not at all) to 7 (very much). Higher scores indicate feeling closer to others.

4.1.3.2.3. Inclusion of Nature in Self (INS). See Pilot Study 1 for more details.

4.1.3.2.4. Close to nature. See Pilot Study 1 for more details (α = .97).

4.1.3.2.5. Feelings. We measured how participants felt after reading the vignette with 10 items of positive (e.g. "satisfied"; α = .90), negative (e.g. "stressed"; α = .84) and neutral affect (with a single item, i.e. "neutral") anchoring from 1 (not at all) to 7 (very much). Higher scores indicate more positive, neutral, and negative feelings respectively.

4.1.3.2.6. Overall experience. See Pilot Study 1 for more details (α = .88).

For the psychometric properties of the scales see Table G.1 and for the means and SDs per condition see Table G.2. (Appendix G).

4.2. Results

First, we examined the effect of the vignettes on IOS: ANOVA analysis showed that the means of both the social (M = 4.28, SD = 1.43) and the environmental condition (M = 4.34, SD = 1.37) were significantly higher than the neutral condition (M = 2.48, SD = 1.50; F (2, 114) = 20.53, $p < .001$, $R^2 = .265$). See Fig. 4.

We also investigated the effect of the vignettes on Close to Others. The results showed that, similarly to IOS, both the social (M = 4.63, SD = 1.28) and the environmental condition (M = 4.30, SD = 1.30) were significantly different from the neutral condition (M = 2.60, SD = 1.31; F (2, 114) = 26.49, $p < .001$, $R^2 = .317$). See Fig. 4.

In addition, we examined the effect of the vignettes on INS: the mean of the environmental condition (M = 5.39, SD = 1.51) was significantly higher than the social condition (M = 4.23, SD = 1.32), which was significantly higher than the neutral condition (M = 2.83, SD = 1.65; F (2, 114) = 28.04, $p < .001$, $R^2 = .330$). See Fig. 4.

Next, we investigated the effect of the vignettes on Close to Nature. Similarly to INS, the results showed that the environmental condition (M = 5.27, SD = 1.37) was significantly higher than the social condition (M = 4.40, SD = 1.46), which was significantly higher than the neutral condition (M = 2.62, SD = 1.42; F (2, 114) = 34.57, $p < .001$, $R^2 = .378$). See Fig. 4.

As in Pilot Study 1, participants reported more positive feelings in the environmental (M = 4.98, SD = 1.18) and the social conditions (M = 4.87, SD = .87) as compared to the neutral condition (M = 4.28, SD = 1.37; F (2, 114) = 3.99, $p < .05$, $R^2 = .065$). See Fig. 4. Again, negative feelings were in general on low levels for all conditions (Ms < 2.23, SDs <.16; F (2, 114) = 2.32, p = n.s).

Finally, we examined the effect of the vignettes on the overall experience of the participants. The results showed that there were no significant differences among conditions (F (2, 114) = .50, p = n.s, R^2 = .039), indicating that the vignettes were equal to each other in terms of

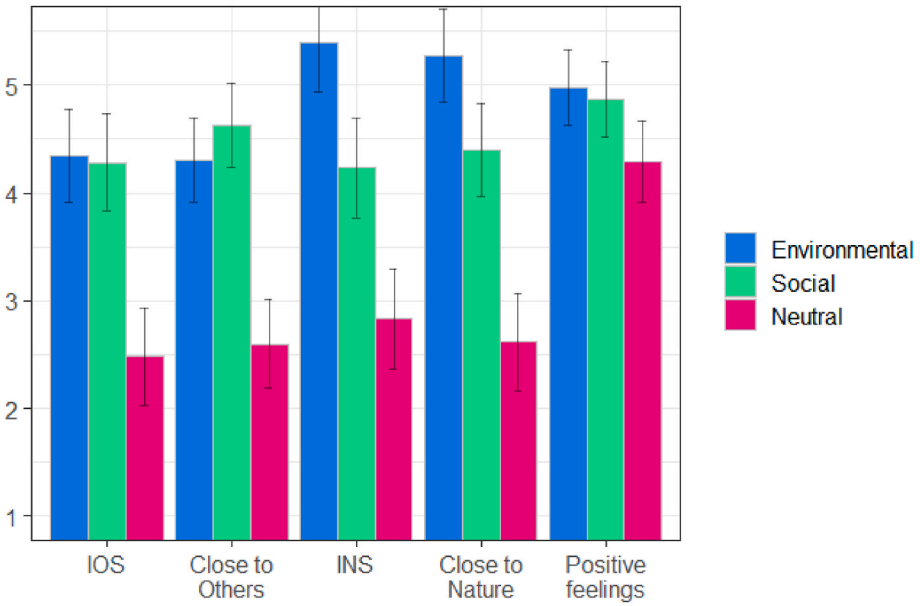

Fig. 4. Mean scores for Inclusion of Other in Self (IOS), Close to Others, Inclusion of Nature in Self (INS), Close to Nature, and Positive feelings, in Environmental, Social and Neutral Conditions. Error bars with 95%CI.

maintaining the focus and the engagement of the participants. For the contrast analysis, see Appendix H.

4.3. Discussion

The results of the second pilot study show that both vignettes worked as intended.

Participants in the social connectedness condition felt closer to others as compared to the neutral condition. Participants in the environmental condition felt closer to nature as compared to participants in the other two conditions. The results also indicate that environmental connectedness induces social connectedness more than social connectedness induces environmental connectedness; reminding participants of the interconnectedness of all life led them feel more interconnected to other people, whereas reminding them of the interconnectedness of all people led them feel more interconnected to nature but less so. We used these vignettes in the subsequent study to induce environmental and social connectedness.

5. Study 2

In the second study, we examined the effect of receiving a reminder of either environmental or social connectedness on Environmental Concern. Similar to Study 1, we expected to observe higher concern as a result of the reminders compared to the control condition. We further expected that the levels of dispositional connectedness (IOS and INS) would interact with the experimental conditions so that people low in connectedness would report more environmental concern after being reminded of environmental or social interconnectedness.

5.1. Method

5.1.1. Participants and procedure

We collected a convenience sample. Eight hundred and fifty-four participants[6] (N = 854, 499 female; Age_M = 44.16, SD = 13.82, Range = 19–87) were recruited through Prolific and successfully completed the study.[7] Out of the participants, 832 were UK and 22 were Irish nationals, and 331 (38.8%) had a University Bachelor's degree.

Participants first gave their informed consent to participate in a study regarding a "visualisation exercise". After completing the online questionnaire, participants were debriefed, and compensated for their time.

5.1.2. Design

Participants were randomised into one of three conditions: environmental connectedness (N = 296), social connectedness (N = 293), and neutral (N = 265). First, participants completed the individual differences measures and then they read the vignette. Next, they answered the manipulation checks and the dependent variables.

[6] By using R-library Superpower (https://cran.r-project.org/web/packages/Superpower/vignettes/ANCOVAs.html), we calculated that for a factor with two levels and each interval being B = .15 (Linear effect total; B = .3) and R^2 = .02 with a single covariate, we would have about 80% power with about 800 participants. Here, we used Study 1's results as a basis for the estimation.

[7] We excluded participants based on the same criteria as in Study 1 (i.e. 6 did not complete the visualisation exercise; 2 in the environmental, 3 in neutral and 2 in social condition, 4 pps were excluded based on time of completion; 2 in the neutral and 2 in the social condition, 21 failed the attention check; 9 in the environmental, 5 in the neutral and 7 in the social condition, and 3 reported that they were not at all engaged in the experience; 1 in the neutral and 2 in the social condition). As in Study 1, we excluded participants who clearly did not react to the visualisation exercise (reported an average score of less than 3 on the Close to Nature scale in the environmental condition; 19 pps), and those who unrealistically reported a very high connection to nature after visualising a building (an average score of higher than 6 in the neutral condition; 21 pps). In addition, we excluded participants who reported an average score of less than 3 on the Close to Others scale in the social condition; 53 pps) and those who unrealistically reported a very high connection to others after visualising a building (an average score of higher than 6 in the neutral condition; 7 pps).

5.1.3. Materials

5.1.3.1. IOS.
See Pilot Study 1 for more details.

5.1.3.2. INS.
See Pilot Study 1 for more details.

5.1.3.3. Vignettes.
We used the same vignettes as in Pilot Study 2.

5.1.3.4. Manipulation checks

5.1.3.4.1. Close to others.
See Pilot Study 2 for more details (α = .96).

5.1.3.4.2. Close to nature.
See Pilot Study 1 for more details (α = .96).

5.1.3.4.3. Overall experience.
See Study 1 for more details.

5.1.3.5. Dependent variables

5.1.3.5.1. Environmental concern.
See Study 1 for more details (Biospheric concern, α = .93; Social concern, α = .88; Egoistic concern, α = .87).[8]

For the psychometric properties of the scales see Table I.1 and for the means and SDs per condition see Table I.2. (Appendix I).

5.2. Results

We first run a one-way ANOVA on the DVs (Environmental Concern Bio, Social and Ego)[9] with Condition as a fixed factor predictor. There was a statistically significant effect on each of the DVs: Environmental Concern Bio (F (2, 851) = 8.53, $p < .001$, $\eta^2 = .019$), Environmental Concern Social (F (2, 851) = 9.74, $p < .001$, $\eta^2 = .022$), and Environmental Concern Ego (F (2, 851) = 4.85, $p = .008$, $\eta^2 = .011$). This implies that the experimental manipulation influenced the levels of the different types of concern that people felt. For the contrast analysis, see Appendix K.

We then inspected the interaction between the standardised INS and the Condition on the three DVs (see Table 2 for full statistics). For Environmental Concern Bio, all predictors and their interaction term were statistically significant (all Fs > 4.18 and all ps < .02). We further inspected the simple slope effects at -1SD and +1SD between the experimental conditions. When INS was low (-1SD), there was a statistically significant difference between the Environmental and Neutral conditions (B_{-1SD} = .32, 95% CI [.11, .54], F (1, 848) = 9.05; p = .002), as well as between the Social and Neutral conditions (B_{-1SD} = .44, 95% CI [.20, .67], F (1, 848) = 13.08; p = .0003). When INS was at mean, the statistically significant difference between the Social and Neutral conditions remained (B_M = .21, 95% CI [.05, .38], F (1, 848) = 6.57; p = .010). See Fig. 5. These results indicate that when people do not feel connected to nature, receiving reminders of connectedness with either nature or other people raises their level of biospheric concern.

Table 2
Inferential statistics for ANOVAs for each DV.

	Environmental Concern Bio		
	F	*p*	η^2
Condition	3.59	**.027**	.008
INS	164.82	**.000**	.162
Condition*INS	4.18	**.015**	.009
R^2	.196		
	Environmental Concern Social		
	F	*p*	η^2
Condition	6.23	**.002**	.014
INS	37.29	**.000**	.042
Condition*INS	2.55	.078	.005
R^2	.072		
	Environmental Concern Ego		
	F	*p*	η^2
Condition	4.28	**.014**	.009
INS	1.75	n.s.	.002
Condition*INS	.25	n.s.	.000
R^2	.014		

Note. Statistically significant effects have been bolded.

VFurthermore, when people feel moderately connected to nature, receiving a reminder of connectedness to other people has a similar effect. However, those who feel connected to nature report high levels of concern towards nature even without the reminders. This latter finding replicates that of Study 1.

For Environmental Concern Social, only the main effects of Condition (F (2, 848) = 6.23, p = .002) and standardised INS were significant (F (1, 848) = 37.29, $p < .0001$). For Environmental Concern Ego, there was only a main effect of Condition (F (2, 848) = 4.28, p = .014). These results show that both receiving a reminder of interconnectedness and feeling close to nature are important factors for increased environmental concern regarding the consequences for the people. However, only receiving a reminder of interconnectedness is important for increased concern regarding one's self, while feeling connected to nature does not seem to influence egoistic concern.

After this, we inspected the interaction between the standardised IOS and the Condition on the three DVs (see Table 3 for full statistics). For Environmental Concern Bio, all predictors and their interaction terms were statistically significant (all Fs > 4.10 and all ps < .016). We further inspected the simple slope effects at -1SD and +1SD between the experimental conditions. When IOS was low (-1SD) or at mean, there was a statistically significant difference between the Environmental and Neutral conditions (B_{-1SD} = .37, 95% CI [.13, .61], F (1, 848) = 9.42; p = .002; B_M = .20, 95% CI [.02, .37], F (1, 848) = 5.14; p = .023), as well as between the Social and Neutral conditions (B_{-1SD} = .58, 95% CI [.33, .84], F (1, 848) = 20.68; $p < .0001$; B_M = .33, 95% CI [.16, .51], F (1, 848) = 13.92; $p < .001$). See Fig. 6. The results indicate that when people do not feel connected to others, receiving reminders of interconnectedness (with either other people or with nature) raises their level of self-reported biospheric concern. Nonetheless, people who feel connected to others report high levels of biospheric concern irrespective of such reminders.

Therefore, the feeling of other connectedness plays an important role in increased concern towards nature. This in essence replicates the results of Study 1, where we found that receiving reminders of nature interconnectedness only made a difference for those who did not feel close to others.

For Environmental Concern Social, only the main effects of Condition (F (2, 848) = 6.90, p = .001) and standardised IOS were significant (F (1, 848) = 78.92, $p < .0001$). The same pattern was observed for Environmental Concern Ego, where again only the main effects of Condition (F (2, 848) = 3.74, p = .024) and standardised IOS were significant (F (1, 848) = 13.13, p = .0003). The results imply that receiving a reminder of interconnectedness and feeling close to others are both important factors for increased environmental concern regarding the consequences for people and one's self. However, these factors contribute independently, rather than in a combined or synergistic manner, to heightened social and egoistic concern.

We then ran a final analysis where we investigated the effects of both standardised IOS and INS and their interaction with the Condition on the DVs. For Environmental Concern Bio, we observed a significant three-way interaction (F (2, 842) = 3.25, p = .03), and a strong main effect of.

INS (F (1, 842) = 146.57, $p < .0001$). These findings show that for individuals who did not feel connected to nature or other people,

[8] In both studies, we assessed Willingness to Change. This measure evaluates participants' willingness to engage in more eco-friendly habits (e.g. recycle more, save more water). Unfortunately, we did not include this measure in our analyses due to an error in the Qualtrics form.

[9] For the factor analysis of the Environmental Concern scale, see Appendix J.

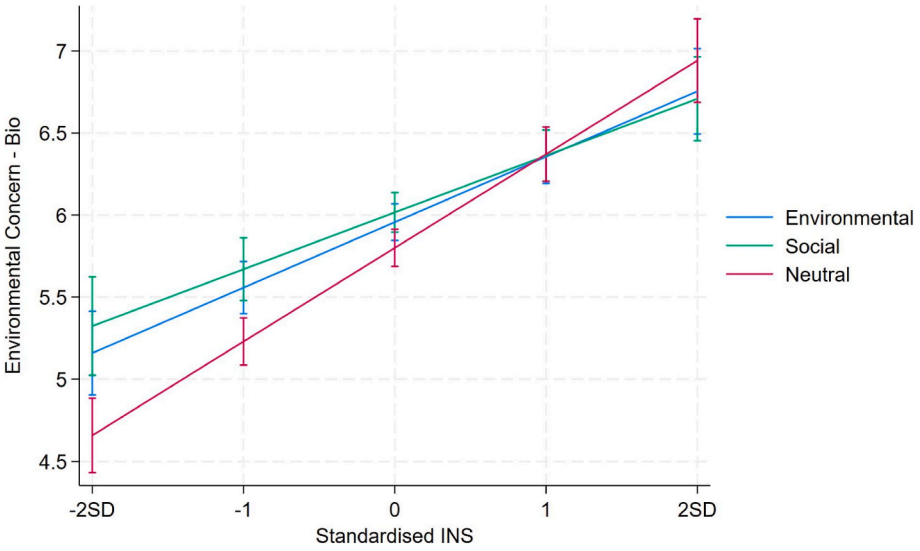

Fig. 5. ANCOVA analysis shows a significant interaction effect between Condition (i.e. receiving a reminder of connectedness with either other people or nature) and INS (i.e. feeling interconnected with nature) on Environmental Concern - Biospheric. In addition, there is a significant main effect of INS.

Table 3
Inferential statistics for ANOVAs for each DV.

	Environmental Concern Bio		
	F	*p*	η^2
Condition	7.09	**.000**	.016
IOS	9.22	**.002**	.010
Condition*IOS	4.10	**.016**	.009
R^2	.042		
	Environmental Concern Social		
	F	*p*	η^2
Condition	6.90	**.001**	.016
IOS	78.92	**.000**	.085
Condition*IOS	.88	n.s.	.002
R^2	.112		
	Environmental Concern Ego		
	F	*p*	η^2
Condition	3.74	**.024**	.008
IOS	13.13	**.000**	.015
Condition*IOS	.88	n.s.	.002
R^2	.030		

Note. Statistically significant effects have been bolded.

receiving a reminder of interconnectedness with either resulted in increased biospheric concern. Moreover, the more people feel connected to nature, the more they feel biospheric concern irrespective of the reminder (see Fig. 7). These findings replicate and extend those of Study 1. In both studies, biospheric concern was the key dependent variable, highlighting the significance of reminders of connectedness, especially for individuals experiencing a sense of disconnection.

For Environmental Concern Social, we only observed the main effects of Condition (F (2, 842) = 5.84, p = .003), INS (F (1, 842) = 20.95, p < .0001), and IOS (F (1, 842) = 61.91, p < .0001). For Environmental Concern Ego, we also observed a significant three-way interaction (F (2, 842) = 4.29, p = .01), as well as the main effects of Condition (F (2, 842) = 5.39, p = .004) and IOS (F (1, 842) = 14.91, p = .0001). These results show that when people are low in one type of connectedness but high in the other, receiving a reminder of either environmental or social connectedness results in increased environmental concern (egoistic). In addition, receiving such reminders led people to think more about these adverse consequences and report higher egoistic concern. Finally, the more people feel connected to other people, the more they feel egoistic concern irrespective of the reminder (see Fig. 8). These findings suggest that in order for human self-preservation mechanisms to activate a connection to a larger whole should first be established. It is also possible that either feeling or being reminded of other connectedness induces egoistic concern as a result of the connection of one's self to other people (especially those in one's immediate circle), that could stimulate feelings of taking care of ones' self in order to care for those around them[10].

5.3. Discussion

In the second study, we examined the effect of feeling connected to nature or other people as well as receiving a reminder of either environmental or social connectedness on environmental concern. We found significant three-way interaction effects between the degree to which people felt connected to nature and other people, and the reminders of connectedness on environmental concern (biospheric and egoistic). Specifically, individuals who did not feel connected to nature or other people reported higher biospheric concern after receiving a reminder of either environmental or social connectedness. Moreover, individuals who did not feel connected to nature or to other people reported higher egoistic concern after receiving a reminder of either environmental or social connectedness. These findings show that receiving reminders of both types of connectedness can increase environmental concern for those with low levels of dispositional connectedness.

We also found a two-way interaction effect between the degree to which people felt connected with nature and the reminders of connectedness on environmental concern (biospheric). Individuals who did not feel connected with nature reported higher biospheric concern after receiving a reminder of either environmental or social connectedness. In addition, we found an interaction between the degree to which people felt connected with other people and the reminders of connectedness on environmental concern (biospheric). Those who did not feel connected with others reported higher biospheric concern after receiving a reminder of either environmental or social connectedness.

Overall, individuals were more likely to feel concern (i.e. biospheric, social, egoistic) when they received reminders of environmental or social connectedness. Again, this finding underlines the importance of inducing environmental and/or social connectedness in promoting environmental attitudes. Nonetheless, individuals who felt already connected with nature were more concerned for the environment and for the people (but not for themselves), while individuals who felt

[10] For the results of the analyses without exclusions, see Appendix L.

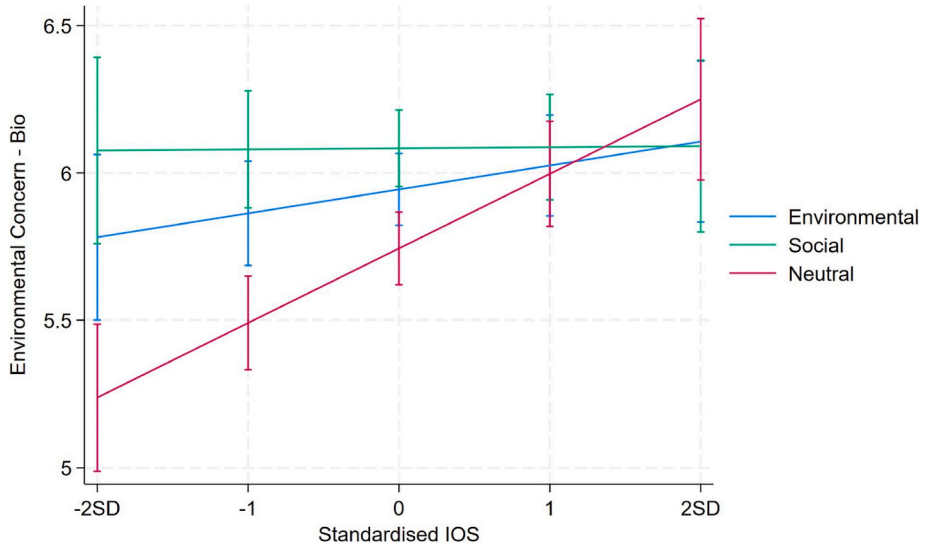

Fig. 6. ANCOVA analysis shows a significant interaction effect between Condition (i.e. receiving a reminder of connectedness with either other people or nature) and IOS (i.e. feeling interconnected with others) on Environmental Concern - Biospheric. In addition, there is a significant main effect of IOS.

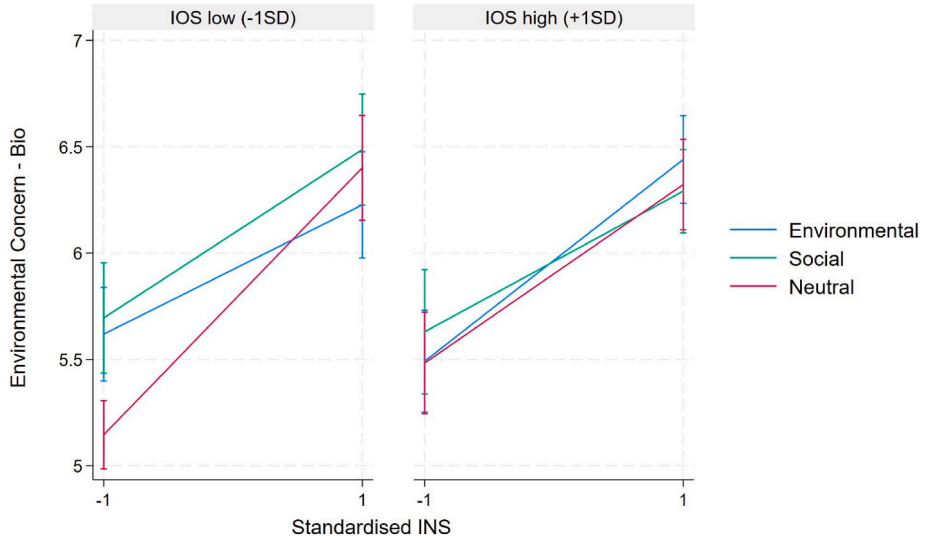

Fig. 7. ANCOVA analysis shows a significant interaction effect between Condition (i.e. receiving a reminder of connectedness with either other people or nature), INS (i.e. feeling interconnected with nature), and IOS (i.e. feeling connected with others) on Environmental Concern - Biospheric. In addition, there is a significant main effect of INS.

already connected with others were more concerned for the environment, for the people and for themselves. These results further highlight the prominence of both feeling connected to nature and to other people in environmental concern. Finally, receiving a reminder of environmental or social connectedness is essential for individuals who do not feel connected on these levels.

The findings replicate and confirm those of Study 1, and are also in accordance with previous environmental ethics, where acknowledging the interconnectedness of the world motivates the protection of the environment (Tilbury, 1995). When people include nature and others in their sense of self, environmental concern increases as caring for the larger world grows (Allen & Ferrand, 1999; Frantz et al., 2005). It is possible that connectedness to nature and others have similar effects on environmental attitudes, due to their common psychological and moral basis which stems from our initial bonds with the world through emotional, cultural and spiritual experiences. Previous research shows that connectedness to nature and others are linked (Lee et al., 2015) and that people may expand their moral circle to first include others and then nature (Rottman et al., 2021). Therefore, a sense of connectedness to nature can be an extension of the human capacity for connection that is anchored in social relationships - as humans make connections with the world first through parents, siblings, and peers. Consequently, people may expand their sense of connection with others to include nature, further influencing and reinforcing their pro-environmental attitudes such as environmental concern on different levels (e.g. biospheric or altruistic). The findings are in line with the VBN model proposing that biospheric and altruistic orientations increase environmental attitudes - including environmental concern (Schultz, 2000; Stern et al., 1999).

6. General discussion

In two studies, we examined how different levels of connectedness predict environmental attitudes. We employed a novel paradigm to induce environmental (Studies 1 & 2) and social connectedness (Study 2), and we also used measures of dispositional connectedness (with

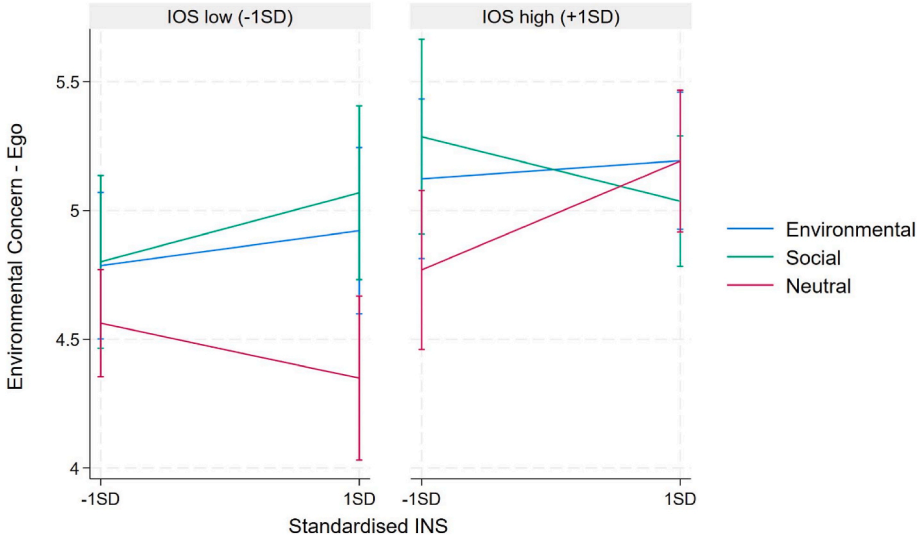

Fig. 8. ANCOVA analysis shows a significant interaction effect between Condition (i.e. receiving a reminder of connectedness with either other people or nature), INS (i.e. feeling interconnected with nature), and IOS (i.e. feeling interconnected with others) on Environmental Concern - Ego. In addition, there are significant main effects of Condition and of IOS.

nature and people) to investigate their effects on environmental attitudes. We expected that individuals with high levels of dispositional connectedness would report more environmental concern (Studies 1 & 2) and awareness of consequences (Study 1) as compared to those with low levels. We also expected that reminders of environmental or social connectedness would result in higher environmental attitudes. Finally, we assumed that there would be an interaction between dispositional and situational connectedness on the environmental attitudes, such as the reminders of connectedness would have a greater impact on individuals with low dispositional connectedness.

We consistently found that individuals who were more connected to either nature or other people reported higher biospheric concern. Furthermore, individuals reported higher biospheric concern after receiving a reminder of connectedness with either nature or other people compared to when they did not. Receiving a reminder of connectedness had a positive impact especially for those who did not feel connected to others. Finally, receiving a reminder of connectedness was highly important when people were not connected to nature or other people,[11] [12].

Additional findings of Study 1 showed that receiving a reminder of environmental connectedness raised awareness of consequences for nature and other people, while dispositional connectedness to other people was also relevant.

Our results highlight the significance of receiving reminders of environmental and social connectedness in strengthening environmental attitudes, especially in people with low dispositional connectedness. This is in accordance with previous work showing that nature-based social activities linked with voluntary and community organisations – such as walking, park prescriptions, and community gardening – can promote nature contact, strengthen social connectedness, and improve long term health (see Leavell et al., 2019 for a review). Such activities are especially suggested for people low in social connectedness. Furthermore, in our studies, there is strong evidence of the prominence of connectedness to other people in predicting environmental attitudes. Finally, our results confirm the essential role of connectedness to nature for environmentalism. Thus, our studies emphasise the impact of feeling connected to both nature and other people.

Importantly, reminders of connectedness can temporarily increase the sense of connection for those who do not initially feel connected. Although alternative hypotheses – such as that reminders of connectedness would have a stronger effect on individuals with pre-existing green dispositions (i.e. those with higher INS) because they have the relevant mental content – may be sensible, they are not supported by our data. Moreover, we tested for potential ceiling effects but we did not find any. Thus, we can theorise that, when individuals are reminded of their connectedness, the emotional bonds with nature are reinforced, making environmental issues feel more concrete and personally relevant – this is in line with Aldo Leopold's (1949) argument. In addition, connections with nature or other people become more cognitively salient, leading to increased concern for the environment and the environmental consequences. Theoretically, this could also be because connectedness creates a sense of shared identity with the natural and the social world, encouraging a perspective where harming the environment feels akin to harming one's community or one's self (Clayton, 2003; Dietz & Whitley, 2018; Schultz & Tabanico, 2007).

In our studies, both environmental and social vignettes had similar effects on environmental attitudes, likely because they tap into shared underlying mechanisms. Previous research shows that there is a positive association between connectedness to nature and connectedness to people (Lee et al., 2015; Moreton et al., 2019; Sanguinetti, 2014). In addition, attributions of moral value to nature and to people are also positively related; people expand their inner moral circle to first include other people and then nature, or to first include nature and then other people (Rottman et al., 2021); our studies support this hypothesis. As such, reminders of environmental connectedness encourage a biospheric orientation where individuals perceive nature as part of themselves, leading to greater environmental concern. Similarly, reminders of social connectedness encourage an altruistic orientation which can promote environmental attitudes as people start to view environmental degradation as a threat to others. It is possible that environmental and social connectedness activate each other as nature connection mechanisms are anchored in the social nature of humans due to the initial human connection to the larger world through a social lens. These findings are in line with the Value-Belief-Norm (VBN) model (Stern et al., 1999),

[11] These results were consistent in both studies, while the effects remained when running the analyses without exclusions; individuals with low dispositional connectedness reported higher biospheric concern after receiving a reminder of environmental or social connectedness.

[12] These results remained the same when we rerun the analyses with heteroscedasticity corrections to take into consideration potential differences in the spread of the error terms between the experimental conditions.

suggesting that connectedness to nature and others can strengthen biospheric and altruistic value orientations, thereby enhancing environmental beliefs and norms.

The findings further highlight the role of both chronic and activated values, in line with the IFEP. This distinction is crucial, as these two types of values operate through distinct mechanisms and should be examined separately. Based on IFEP, biospheric and altruistic values are central to understanding environmental engagement, as they shape the strength of normative goals, which in turn influence how individuals perceive situations based on the salience of relevant information. In accordance with this, values influence behaviour as they initiate norm activation, eliciting a moral obligation to act upon them (Schwartz, 1977). Nonetheless, other research has shown that values only drive behaviour when they are part of one's self-concept (Verplanken & Holland, 2002), such as including nature and others in oneself. Values further influence the awareness of the negative consequences of environmentally harmful behaviour (i.e., problem awareness); that is, problem awareness increases when biospheric values are stronger (Schultz et al., 2005; Stern et al., 1995). Finally, values influence behaviour because they affect the extent to which people see themselves as pro-environmental (i.e. self-identity) and this effect is stronger when the self is activated (Verplanken & Holland, 2002). Thus, identity functions as a link between values and behaviour (Van der Werff et al., 2013). The results of this paper support these previous findings, as we found that including other people in oneself, which is an altruistic value orientation (chronic value; self-concept), moderates the relationship between environmental connectedness (activated value; the reminder) and environmental concern. In other words, situational cues are moderated by individual differences in chronic values. In addition, people were more likely to feel concern for nature and become aware of the negative consequences of environmental degradation, when they were reminded of the connectedness with the natural world and other people. This suggests that reminders of connectedness can enhance biospheric and altruistic values when they are not chronic. In other words, people can become environmentally engaged by certain situational cues (that make moral norms more salient) even if they do not hold certain values strongly.

The findings are also in line with previous research showing that connectedness to nature promotes environmental attitudes (Dutcher et al., 2007; Gkargkavouzi et al., 2019; Nisbet et al., 2009; Schultz, 2000) and behaviours (Duong & Pensini, 2023; Martin et al., 2020; Whitburn et al., 2020), and with other research showing a positive relationship between connectedness to people and environmental attitudes (Loy & Spence, 2020) and behaviours (Der-Karabetian et al., 2014; Duong & Pensini, 2023). Our results add further support to the positive relationship between connectedness to nature and connectedness to people (Lee et al., 2015; Moreton et al., 2019). Finally, these results complement previous work showing that individuals who feel connected to nature and/or to other people are more likely to adopt environmental attitudes and behaviours through increased moral consideration, as the perceived interconnection of life becomes more salient (Drosinou et al., 2023).

Although there is previous evidence for the effect of connectedness to nature on environmental concern (Schultz, 2000), research on the impact of other types of connectedness remains scarce. In addition, there is a notable absence of experimental research that simultaneously investigates both environmental and social connectedness. We addressed this gap in the literature by exploring the interplay between two types of connectedness – both dispositionally and situationally – and their collective influence on environmental attitudes. We employed an experimental design and we further developed a novel paradigm in order to increase environmental and social connectedness.

Our paper thus adds to the ongoing discussion regarding interconnectedness highlighting its potential as an explaining factor in environmental attitudes (Gkargkavouzi et al., 2019; Loy & Spence, 2020; Roszak, 1995). Our research further shows that feelings of both environmental and social connectedness can be enhanced (especially for those who do not feel connected on these levels), and that receiving reminders of both types of connectedness increases environmental concern and awareness of consequences regarding the environmental degradation. As a result, both types of connectedness – at dispositional and situational levels – should be taken into account in future research to predict environmental measures in order to increase our understanding of our relationship with the natural environment. In our paper, we develop a novel paradigm in order to enhance environmental and social connectedness; giving small reminders of interconnectedness to people is essential for environmentalism and has several implications for future research, policy and environmental education. Reminders of connectedness can also play a role in sustaining long-term environmental behaviours. According to the theory of planned behaviour (TPB; Ajzen, 1991, 2011), attitudes influence intentions, which in turn predict behaviour. By reinforcing connectedness, reminders can help shape positive attitudes toward the environment, which can lead to stronger behavioural intentions and more consistent pro-environmental actions.

Our studies have the usual limitations of social psychological studies (Clarke et al., 2023; Richard et al., 2003). In the Pilot Studies, we followed the APA (2012) recommendation (i.e. 30 participants per cell), however this practice has been recently criticized (see Lakens, 2022 for a critical discussion). Furthermore, the sample size in Study 1 was slightly smaller than aspired, while in both Study 1 and Study 2, the participants were probably more educated and technologically savvy than average, making the samples non-representative. In addition, all of our measures were self-reported ones, related to well-known weaknesses (Paulhus & Vazire, 2007). We tried to mitigate these limitations by running two experimental studies with very big samples and focusing on the results that remained consistent in both studies (e.g. reminders of connectedness had a positive impact especially for individuals who were not connected to others). However, the findings should be interpreted with caution as additional research is necessary to establish further the conclusions. Finally, our studies were not preregistered. Nonetheless, preregistration offers many advantages and future studies would benefit from this practice.

Future research is needed in order to replicate these results across diverse demographic samples and various populations. Cross-cultural studies could also be conducted to explore potential cultural differences in the relationship between connectedness and environmental attitudes; there might be a stronger baseline concern for environmental issues in collectivist cultures, where social connectedness is typically emphasised, compared to individualist cultures. Similarly there could be cultural differences in the degree that individuals feel connected to nature depending on the geographical area they live. In addition, various environmental measures (e.g. the New Environmental Paradigm; NEP; Dunlap et al., 2000) can be adopted to replicate and enrich these findings. Other (non self-report) measures include the Implicit Association Test (IAT) that measures the tendency to associate ones's self with the environment (Schultz & Tabanico, 2007), and actual behaviour measures such as donation to an environmental cause. Moreover, both types of connectedness should be examined more deeply in relation to environmentalism, as they both have essential implications for environmental engagement. Future studies could also examine the potential mediation effects of these findings. Given that the environmental issue becomes more and more urgent, connectedness could address some of the gaps in our current knowledge (see Zylstra et al., 2014 for a review).

Better understanding the influence of both types of connectedness on environmental attitudes also has practical implications for policy-making. Implementing educational programs that highlight the interdependence between humans and nature can cultivate a collective environmental ethic. In addition, developing environmental education, nature-based programs or community engagement practices can foster a sense of connectedness (Leavell et al., 2019; Liefländer et al., 2013; Passmore & Holder, 2017). As such, interventions designed to increase

environmental and social connectedness could be effective in promoting environmental behaviours.

7. Conclusion

Our paper highlights the significance of connectedness in environmental research, illustrating that social connectedness is also highly relevant in adopting environmental attitudes. Most crucially, this paper highlights that in the near future, if humanity is to solve the environmental problems that we face, we need to feel more connected to the world around us.

Consequently, it is of utmost importance to address any prevailing feelings of disconnectedness within our societies. By fostering a collective sense of belonging and responsibility we can create sustainable solutions and protect the future of our planet.

CRediT authorship contribution statement

Marianna Drosinou: Writing – review & editing, Writing – original draft, Visualization, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation. **Jussi Palomäki:** Writing – review & editing, Visualization, Supervision, Software, Resources. **Markus Jokela:** Writing – review & editing, Supervision, Funding acquisition. **Michael Laakasuo:** Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Methodology, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Data availability statement

All data used in the analyses of this article are available from the corresponding author upon request.

Ethics statement

All local laws governing research ethics were complied with in full. All APA ethical guidelines were followed. All procedures performed in studies involving were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. The research procedures and protocols were covered by the ethics statement by the University of [Blinded for Peer Review] Ethical Review Board in Humanities and Social Sciences.

Declaration of competing interest

The authors declare that they have no conflict of interest.

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Appendix ASupplementary data

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